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DESCRIPTION

Blade for Cutting a Moving Material Web

FIELD OF THE INVENTION

The invention relates to a blade for cutting a moving material web, in particular for cutting paper or cardboard webs or plastic or metal foils.

STATE OF THE ART

In treatment machines for paper or cardboard webs or plastic or metal foils different types of blades are used in order to cut the moving webs longitudinally or transversely. Thus roll-cutting machines for paper or cardboard webs or plastic foils normally have a longitudinal-cutting device with several pairs of circular blades that each cut a strip out longitudinally. Thus a wide material web is cut into smaller strips that are subsequently wound up on rolls. Transverse cutting machines to make individual sheets from a material web have in addition to a longitudinal cutting device a transverse cutting device that typically is formed of two cutting drums that each have a surface equipped with one or more transverse blades extending over the length of the drum.

The pairs of circular blades of longitudinal cutting devices each have a cup-shaped blade supporting the web during

cutting and a piercing blade engaged into the web with the cutting edges held in an exact desired cut position. Typically the lower cup-shaped blade is driven while the disk-shaped piercing blade is positioned above it and is freely rotatable (German 3,419,843).

Normally the circular blades in longitudinal cutting devices and the transverse blades in transverse cutting devices are made of steel. They are subject when cutting to substantial wear and thus must be resharpened or replaced at regular intervals. In order to get a clean cut it is necessary to exactly position the blades and maintain this position.

In order to increase the service life of the blades it is known from EP 0,297,399 to make the cutting edges from a hard metal. The application of one or more layers of a hard material to a strip blade is described in EP 0,327,530. A moderately alloyed preferably not stainless steel but rather carbon steel blade is provided at its edge by means of a pulsed CPVD method with a hard layer of nitride, carbide, and/or oxide, carbon nitride and/or oxicarbonitride of the elements of Groups IVb, Vb, or VIB of the periodic table or a nitride of boron, aluminum, silicon, molybdenum, tungsten, or a titanium carbonitride and/or titanium nitride.

The technical procedure of ion implantation for reducing wear of steel is described in the brochure "Plasma-aided Method of Surface Treatment" of the organization Plasmaoberflächen-Technology of the German Gesellschaft für Galvano- und Oberflächentechnik e. V. of Horionsplatz 6, D-40213 Dusseldorf. With ion implantation

bombardment of surfaces with energy-rich ions of chemical elements imbeds these in the surfaces of these materials.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a blade for cutting moving material webs that is inexpensive to manufacture but has a long service life even when cutting abrasive paper or cardboard webs.

This object is achieved by the features of claim 1.

According to the invention a blade body has a steel cutting edge. At least a surface of the cutting edge is coated by means of a plasma-aided CPVD method with foreign ions to a depth between 50 μm and 500 μm, preferably 100 μm to 200 μm.. This dosing with foreign ions in the metal lattice optimally improves hardness for cutting without making the steel too brittle or influencing its ductility. Preferably, as described in claim 2, foreign ions are layered such that at least the cutting edge has a hardness of 800 HV to 1300 HV, preferably 900 HV to 1200 HV, in particular 950 HV to 1050 HV. According to the invention circular blades with such a hardness have a service life in longitudinal cutting devices that is increased by a multiple without the cutting edges failing under stress. Such blades can cut with great accuracy.

Particularly suitable is coating with nitrogen, carbon, molybdenum, tungsten, and/or titanium in variable quantities per mole of steel. The portion of foreign ions that are molybdenum or tungsten ions is smaller than the portion that is titanium ions.

The steal at least for the cutting edge and preferably for the entire blade body is preferably a heat-treated steel, preferably a rolled steel, a high-speed steel, or tool steel, in particular a cold-worked steel, for example a high-alloy chromium-vanadium steel.

BRIEF DESCRIPTION OF THE DRAWING

The drawing serves for describing the invention by means of a simplified illustrated embodiment.

FIG. 1 is a section through a pair of circular cutters of a longitudinal cutting device for cutting paper or cardboard webs.

EMBODIMENT OF THE INVENTION

The pair of circular blades includes as upper blade 1 a disk-shaped circular blade and as lower blade 2 a cup-shaped circular blade. Such blade shapes are described for example in German 3,419,843 or EP 0,297,399.

The upper blade 1 has a disk-shaped blade body 3 with a central hole 4 that is fitted to a bearing on a blade shaft and

secured thereto. The blade body 3 has a frustoconical outer edge that forms a sharp cutting edge 5.

The lower blade 2 has a cup-shaped blade body 6 that also has a central hole 7 through which passes a shaft of a longitudinal cutting device. A cutting edge 8 of the cup-shaped lower blade 2 is formed at a radial outer edge of a cylindrical part 9 of the blade body 6 that is bent off perpendicular to the hole 7 and parallel to the blade shaft.

At least in the region of the cutting edges 5 and 8 of the blades 1 and 2 and preferably the entire blade bodies 3 and 6 including the cutting edges 5 and 8 are of steel. Preferably a worked steel, a roller-bearing steel, a high-speed steel, or a tool steel is used that is subsequently treated in the below-described manner. Circular blades for longitudinally cutting paper or cardboard webs are ideally made starting from a cold-worked tool steel, in particular a high-alloy chromium-vanadium steel.

After making the basic shape of the blade bodies 3 and 6 at least the cutting edges 5 and 8 and preferably the entire blade bodies 3 and 6 are treated by means of a plasma-aided method by ion implantation so that foreign ions are implanted from outside in the outer regions of the metal lattice. Dosing with foreign ions is done such that foreign ions penetrate to a depth of 50 μm to 500 μm, preferably 100 μm to 200 μm. The foreign ions are nitrogen, carbon, molybdenum, tungsten and/or titanium ions. Preferably the proportion of molybdenum or tungsten ions is greater than the proportion of titanium ions.

The type of foreign ion, the treatment temperature, and the treatment time of the pulsed plasma are set such that at least the cutting edges 5 and 8 and preferably the entire blade bodies 3 and 6 attain a Vickers hardness of 800 HV to 1300 HV, preferably 900 HV to 1200 HV. For circular blades for longitudinal cutting a hardness of 950 HV to 1050 HV is particular suitable. The treatment temperature in the plasma during treatment attains 180°C to 350°C, preferably 220°C to 280°C.